

RESPONSE UNDER 37 C.F.R. §1.111

Application Number: 10/593,444

Attorney Docket Number: 029567-00011

AMENDMENTS TO THE SPECIFICATION

Please amend the Specification as follows:

[0009]To achieve the above object, the invention of ~~claim 1 among unit layer post-processing catalyst chemical vapor deposition apparatuses of the present invention~~ is a catalyst chemical-vapor- deposition apparatus for forming a thin film on a substrate by using the catalyst action of an exothermic catalytic body resistance-heated in a reactive vessel capable of performing vacuum pumping, which is provided with a gas supply system capable of introducing pulsed flows rates of thin-film-component-contained gas and hydrogen gas into the reactive vessel like a pulse and an exhaust system capable of realizing vacuum pumping and pressure control and has a constitution in which the thin-film-component-contained gas and hydrogen gas introduced like a pulse contact with the exothermic catalyst body and decompose, a thin film for each unit layer is formed on the substrate and the thin film for each unit layer is surface-treated to form a laminated thin film.

[0010]Moreover, the invention of ~~claim 2~~ is characterized in that the surface treatment is one or both of surface treatment by a thin-film-component-contained gas excluding silicon and including active species and surface treatment by hydrogen gas containing active species.

[0011]Furthermore, the invention of ~~claim 3~~ is characterized in that the hydrogen gas is applied to the exothermic catalytic body to reproduce a catalytic performance.

RESPONSE UNDER 37 C.F.R. §1.111

Application Number: 10/593,444
Attorney Docket Number: 029567-00011

[0012]The invention of ~~claim 4~~ is characterized in that the surface treatment is one or both of extraction treatment of surplus thin-film component and direct addition treatment of thin-film component.

[0013]The invention of ~~claim 5~~ is characterized by using nitrogen gas or rare gas instead of the hydrogen gas.

[0014]The invention of ~~claim 6~~ is characterized in that the thin-film-component-contained gas is any one of hydride of silicon and halide of silicon, any one of nitrogen and hydride of nitrogen, or both of nitrogen and hydride of nitrogen.

[0015]The invention of ~~claim 7~~ is characterized in that the thin-film-component-contained gas including active species in the surface treatment is any one of nitrogen and hydride of nitrogen or both of them.

[0016]The invention of ~~claim 8~~ among unit-layer post-processing film forming methods of the present invention is a catalyst chemical vapor deposition method for using the catalyst action of an exothermic catalytic body resistance-heated in a reactive vessel capable of performing vacuum pumping and thereby forming a thin film on a substrate, in which the following steps are included: an activating step of introducing pulsed flows rates of thin-film-component-contained gas and hydrogen gas ~~like a pulse~~, bringing the gases into contact with an exothermic catalytic body and thereby, generating active species, a film forming step of forming a thin film every unit layer on a substrate, a film

RESPONSE UNDER 37 C.F.R. §1.111

Application Number: 10/593,444
Attorney Docket Number: 029567-00011

forming step of surface-treating a thin film for each unit layer on the substrate, a surface treating step of performing surface treatment of a thin film for unit layer by hydrogen gas containing active species, another surface treating step of surface-treating a thin film every unit layer by thin-film-component-contained gas including active species to form a thin film laminated by using a series of steps for respectively forming a unit-layer thin film as one cycle.

[0017]Moreover, the invention of ~~claim 9~~ is characterized by repeating any one of the one surface treating step and the other surface treating step up to a plurality of times in one cycle in addition to the above configuration.

[0018]Furthermore, the invention of ~~claim 10~~ is characterized in that one or both of the one surface treating step and the other surface treating step and the film forming step of forming a thin film for each unit layer on a substrate are continuously performed.

[0019]The invention of ~~claim 11~~ is characterized by vacuum-pumping remaining gas after any one of the one surface treating step and the other surface treating step.

[0020]The invention of ~~claim 12~~ is characterized in that the one surface treating step is a step of extracting surplus thin-film component and the other surface treating step is a step of adding a thin-film component.

[0021]The invention of ~~claim 13~~ is characterized in that a final step of one cycle is a step

RESPONSE UNDER 37 C.F.R. §1.111

Application Number: 10/593,444
Attorney Docket Number: 029567-00011

of performing surface treatment by a thin-film-component-contained gas excluding silicone including active species.

[0022]The invention of ~~claim 14~~ is characterized by using any one of nitrogen gas and rare gas instead of the hydrogen gas.

[0023]The invention of ~~claim 15~~ is characterized in that the thin-film-component-contained gas includes any one of hydride of silicon and halide of silicon and any one of nitrogen and hydride of nitrogen or both of them.

[0024]The invention of ~~claim 16~~ is characterized in that the thin-film-component-contained gas including active species in the surface treatment contains one or both of nitrogen gas and hydride of nitrogen.

[0025]The invention of ~~claim 17~~ is characterized in that thin-film-component-contained gas contains monosilane gas and ammonia gas, the film forming step forms a silicon nitride film on a substrate every unit layer and the other surface treating step surface-treats a silicon nitride film every unit layer by ammonium gas including active species.

[0026]The invention of ~~claim 18~~ is characterized in that the final step of one cycle is a step of performing surface treatment by ammonium gas which is thin-film-component-contained gas including active species.

RESPONSE UNDER 37 C.F.R. §1.111

Application Number: 10/593,444

Attorney Docket Number: 029567-00011

[0093] Moreover, as gas containing a nitrogen component, it is possible to use ~~nitrogen hydride containing nitrogen such as~~ nitrogen (N_2) or hydrazine (N_2H_4) in addition to ammonia.

[0094] It is possible to use ~~rare gas and~~ nitrogen gas and an inert gas, such as argon and helium, in addition to hydrogen gas.

[0095] ~~In this case, The~~ thin-film-component-contained gas may also include includes steam. For example, gas which is liquid at room temperature is used as thin-film-component-contained gas in which steam pressure is adjusted through bubbling by carrier gas.